

MISSOURI RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Pony Creek Lake Water Quality Impairment: Eutrophication

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Big Nemaha

Counties: Brown & Nemaha

HUC 8: 10240008

HUC 11 (HUC 14): 050 (010)

Drainage Area: Approximately 6.56 square miles.

Conservation Pool: Area = 180 acres, Maximum Depth = 10 meters

Designated Uses: Secondary Contact Recreation, Expected Aquatic Life Support, Drinking Water, Industrial Water Supply, and Food Procurement

1998 303d Listing: Table 4 - Water Quality Limited Lakes

Impaired Use: All uses are impaired to a degree by eutrophication

Water Quality Standard: Nutrients - Narrative: The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life. (KAR 28-16-28e(c)(2)(B)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR 28-16-28e(c)(7)(A)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

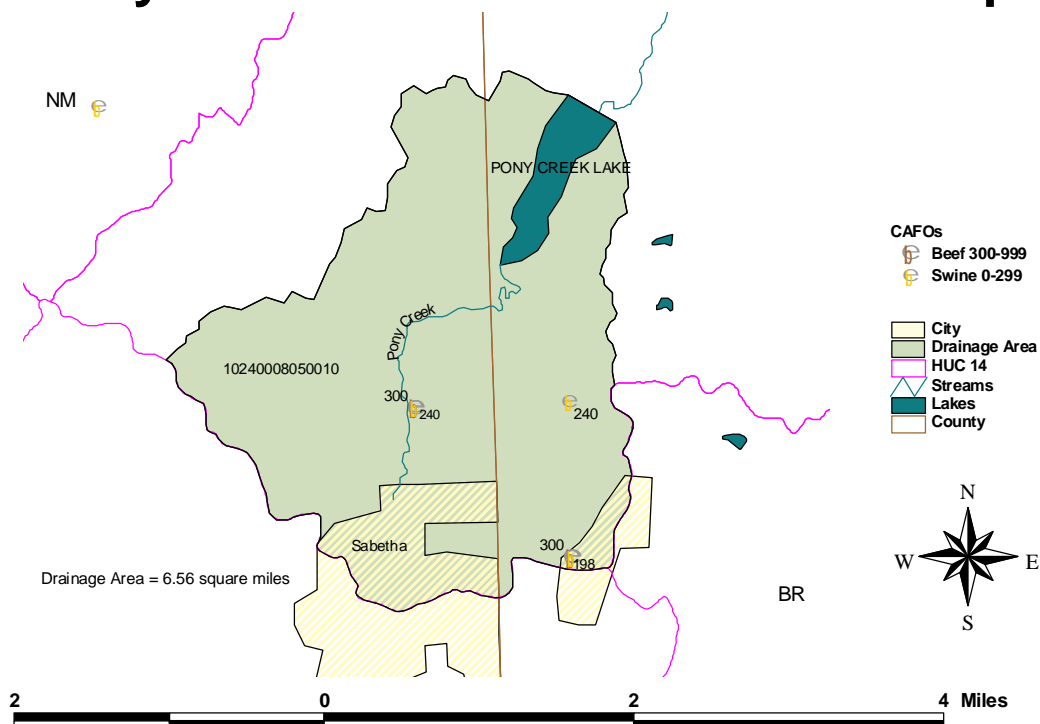
Level of Eutrophication: Hypereutrophic, Trophic State Index = 65.48

Monitoring Sites: Station 073001 in Pony Creek Lake (Figure 1).

Period of Record Used: Three surveys in 1994 - 2000.

Figure 1

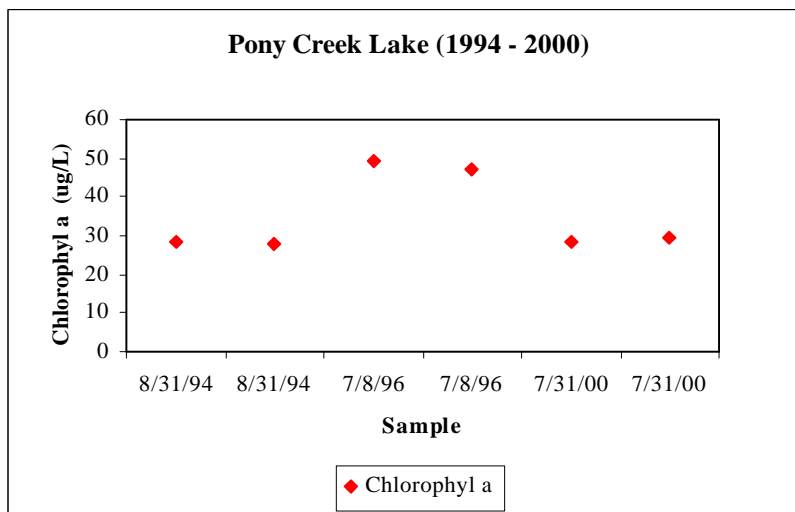
Pony Creek Lake TMDL Reference Map



Current Condition: Pony Creek Lake has elevated chlorophyll a concentrations averaging 35.1 ppb (Figure 2). This relates to a Trophic State Index of 65.48, indicating hypereutrophic conditions. The chlorophyll a concentration was most elevated (averaging 48.4 ppb) in the 1996 survey. During the 1994 and 2000 surveys, the average concentration (28.5 ppb) was not as high.

Figure 2

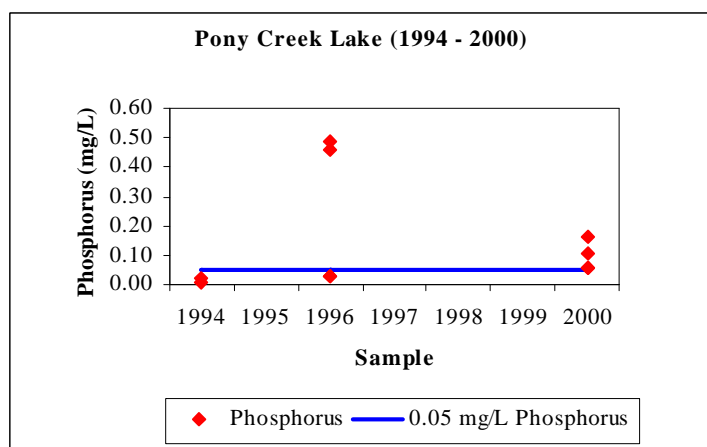
The Trophic State Index is derived from the chlorophyll a concentration. Trophic state assessments of potential algal productivity were made based on chlorophyll a concentrations, nutrient levels



and values of the Carlson Trophic State Index (TSI). Generally, some degree of eutrophic conditions is seen with chlorophyll a concentrations over 7 ug/l and hypereutrophy occurs at levels over 30 ug/l. The Carlson TSI, derives from the chlorophyll concentrations and scales the trophic state as follows:

1. Oligotrophic	TSI < 40
2. Mesotrophic	TSI: 40 - 49.99
3. Slightly Eutrophic	TSI: 50 - 54.99
4. Fully Eutrophic	TSI: 55 - 59.99
5. Very Eutrophic	TSI: 60 - 63.99
6. Hypereutrophic	TSI: \geq 64

Figure 3



The total phosphorus concentrations are high, averaging 142.1 ppb (Figure 3). Sixty percent of the samples are over 50 ppb. The total nitrogen to total phosphorus ratio is 11.8, indicating that phosphorus and nitrogen are most likely co-limiting. The average nitrogen concentrations are as follows: 0.01 mg/L Nitrate, 0.05 mg/L Nitrite, and 1.61 mg/L Total Kjeldahl Nitrogen. The chlorophyll a to total phosphorus yield is moderate. Light is not indicated to be limiting.

Interim Endpoints of Water Quality (Implied Load Capacity) at Pony Creek Lake over 2005 - 2009:

In order to improve the trophic condition of the lake from its current hypereutrophic status, the desired endpoint will be summer chlorophyll a concentrations at or below 20 ug/l, corresponding to a trophic state of eutrophic conditions by 2009. Refined endpoints will be developed in 2005 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

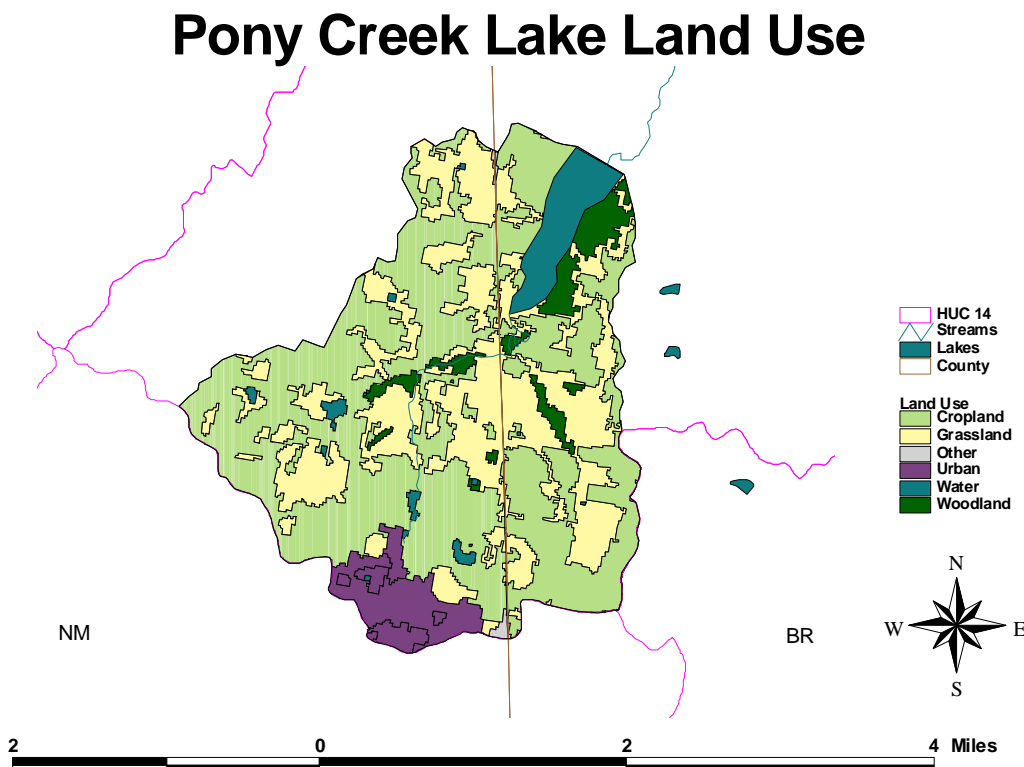
3. SOURCE INVENTORY AND ASSESSMENT

Land Use: Pony Creek Lake has a high potential for nonpoint source pollutants. An annual phosphorus load of 19,596.7 pounds per year and an annual nitrogen load of 29,414.6 pounds per year is necessary to correspond to the concentrations seen in the lake.

A source of phosphorus within the Pony Creek Lake is probably runoff from agricultural lands where phosphorus has been applied. Land use coverage analysis indicates that 54.1% of the

watershed is cropland (Figure 4). In 1999, a combined total of 58,233 tons of fertilizer were sold in Brown and Nemaha Counties. Assuming that the drainage area of the Pony Creek Lake covers 0.513% of those counties, then 299 tons of fertilizer were bought and potentially used with the watershed.

Figure 4



Animal waste adds to the phosphorus load going into the Pony Creek Lake. Thirty-two percent of land around the lake is grassland. Horses are located in the grassland adjacent to the lake and may contribute to the phosphorus load. The summer grazing density of livestock is low. Animal waste, from confined animal feeding operations, adds to the nitrogen and phosphorus load going into Pony Creek Lake. There are 2 beef and 3 swine animal feeding operations in the watershed. Potential animal units for all facilities in the watershed total 1,278. The actual number of animal units on site is variable, but typically less than potential numbers.

Fertilizer applications to lawns within the drainage and stormwater delivery to the lake are probable loading sources. The land use analysis performed in 1993 indicated that six percent of the watershed is urban. The population of Sabetha is expected to grow 10% through 2020. The drinking water use and the point source load will increase as the population enlarges. The

population density is moderate.

Background Levels: Seven percent of the watershed is woodland; leaf litter may be adding to the nutrient load. The atmospheric phosphorus and geological formations (i.e. soil and bedrock) may contribute to phosphorus loads. Fish feeding stations add an insignificant amount of nutrients to the load.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

Phosphorus and nitrogen are co-limiting nutrients in Pony Creek Lake and allocated under this TMDL. More detailed assessment of sources and confirmation of the trophic state of the lake must be completed before detailed allocations can be made. The general inventory of sources within the drainage does provide some guidance as to areas of load reduction.

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current Wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

Nonpoint Sources: The assessment suggests that cropland, animal waste, and urban sources contribute to the hypereutrophic state of the lake. Water quality violations are partially due to leaf litter and geology. Generally a Load Allocation of 3,017.9 pounds of total phosphorus per year, leading to an 82.9% reduction, is necessary to reach the endpoint. The nitrogen load is 13,098.3 pounds per year, a 50.5% reduction.

Defined Margin of Safety: The margin of safety provides some hedge against the uncertainty of variable annual total phosphorus loads and the chlorophyll a endpoint. Therefore, the margin of safety will be 335.3 pounds of total phosphorus per year and 1,455.4 pounds per year of nitrogen taken from the load capacity subtracted to compensate for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality.

State Water Plan Implementation Priority: Because the Pony Creek Lake is used for drinking water, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Big Nemaha (HUC 8: 10240008) with a priority ranking of 37 (Medium Priority for restoration).

Priority HUC 11s: The majority of the watershed is within HUC 11 (050).

5. IMPLEMENTATION

Desired Implementation Activities

There is potential that agricultural best management practices will improve the condition of Pony Creek Lake. Some of the recommended agricultural practices are as follows:

1. Implement soil sampling to recommend appropriate fertilizer applications on cropland.
2. Maintain conservation tillage and contour farming to minimize cropland erosion.
3. Install grass buffer strips along streams.
4. Reduce activities within riparian areas.
5. Implement nutrient management plans to manage manure application to land.

Implementation Programs Guidance

Fisheries Management - KDWP

- a. Assist evaluation in-lake or near-lake potential sources of nutrients to lake.
- b. Advise county on applicable lake management techniques which may reduce nutrient loading and cycling in lake.

Nonpoint Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for reduction of sediment runoff from agricultural activities as well as nutrient management.
- b. Provide technical assistance on practices geared to establishment of vegetative buffer strips.
- c. Provide technical assistance on nutrient management in vicinity of streams.
- d. Assist evaluation of stormwater quality from urbanized areas of watershed.
- e. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

Water Resource Cost Share and Nonpoint Source Pollution Control Programs--SCC

- a. Apply conservation farming practices, including terraces and waterways, sediment control basins, and constructed lakes.
- b. Provide sediment control practices to minimize erosion and sediment and nutrient transport.
- c. Re-evaluate nonpoint source pollution control methods.

Riparian Protection Program - SCC

- a. Establish or reestablish natural riparian systems, including vegetative filter strips and streambank vegetation.
- b. Develop riparian restoration projects.
- c. Promote lake construction to assimilate nutrient loadings.

Buffer Initiative Program - SCC

- a. Install grass buffer strips near streams.
- b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Extension Outreach and Technical Assistance - Kansas State University

- a. Educate agricultural producers on sediment, nutrient and pasture management.
- b. Educate livestock producers on livestock waste management and manure applications and nutrient management planning.
- c. Provide technical assistance on livestock waste management systems and nutrient management plans.
- d. Provide technical assistance on buffer strip design and minimizing cropland runoff.
- e. Encourage annual soil testing to determine capacity of field to hold phosphorus.

Time Frame for Implementation: Pollutant reduction practices should be installed within the priority subwatersheds during the years 2002-2006, with minor follow up implementation, including other subwatersheds over 2006-2010.

Targeted Participants: Primary participants for implementation will be the City of Sabetha, the Kansas Department of Wildlife and Parks, and agricultural producers within the drainage of the lake. Initial work in 2006 should include local assessments by conservation district personnel and county extension agents to locate within the lake drainage:

1. Total row crop acreage
2. Cultivation alongside lake
3. Livestock use of riparian areas
4. Fields with manure applications

Milestone for 2006: The year 2006 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Pony Creek Lake should indicate evidence of reduced phosphorus levels in the conservation pool elevations relative to the conditions seen in 1994 and 2000.

Delivery Agents: The primary delivery agents for program participation will be the City of Sabetha, the Kansas Department of Wildlife and Parks, conservation districts for programs of the State Conservation Commission, and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollutants.

1. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to

protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.

2. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.

3. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.

4. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

5. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.

6. The *Kansas Water Plan* and the Missouri Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a High Priority consideration.

Effectiveness: Nutrient control has been proven effective through conservation tillage, contour farming and use of grass waterways and buffer strips. The key to success will be widespread utilization of conservation farming within the watersheds cited in this TMDL.

6. MONITORING

Additional data, to establish nutrient ratios, source loading and further determine mean summer lake trophic condition, would be of value prior to 2005. Further sampling and evaluation should occur once before 2005 and twice between 2005 and 2009.

7. FEEDBACK

Public Meeting: A public meeting to discuss TMDLs in the Missouri Basin was held February 28, 2001 in Atchison. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Missouri Basin.

Public Hearing: A Public Hearing on the TMDLs of the Missouri Basin was held in Hiawatha on May 29, 2001.

Basin Advisory Committee: The Missouri Basin Advisory Committee met to discuss the TMDLs in the basin on October 3, 2000, February 28 and May 29, 2001.

Milestone Evaluation: In 2006, evaluation will be made as to the degree of impairment which has occurred within the drainage and current condition of Pony Creek Lake. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the nonpriority subwatersheds.

Consideration for 303(d) Delisting: Pony Creek Lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable nutrient criterion during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process during Fiscal Years 2002-2006.

Bibliography

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Stiles, Thomas C. 1999, *Rationale and Reference to Selected TMDL Issues* [Memorandum] 6 Aug. 1999